Effects of light intensity on leaf production under water stress in two different strains of *Arabidopsis thaliana*

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Introduction

Light and water are important components for photosynthesis and their availability in the wild can vary considerably. Plants must have mechanisms to deal with variation in order to continue growth despite less than optimal conditions.The growth of two strains of *Arabidopsis thaliana* was tested under various combinations of high and low light intensity and water availability conditions. The strains were monitored to determine any significant differences in the quality and rate of growth. Two strains were used in the experiment in order to observe differences in their ability to cope with the specified conditions. Mt-0 is a strain from Libya,while Col-0 is laboratory strain originally selected at University of Missouri-Columbia. Libya is located at a low latitude in a desert biome and therefore, Mt-o should be better at acclimatizing to high light intensity and low water conditions than the laboratory strain, Col-o.

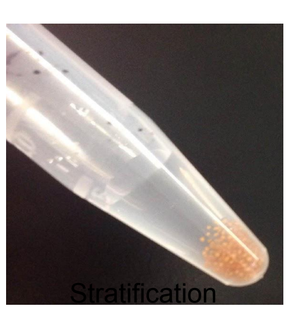
Hypothesis High light intensity and high water availability will result in a significant difference in the growth of *A. thaliana* favoring the Mt-0 versus the Col-0 strains due to its enhanced ability to acclimatize to increased light intensity.

Treatment

Col-0 high water high light	Col-0 high water low light	Col-0 low water high light	Col-0 low water low light
Mt-0 high water high light	Mt-0 high water low light	Mt-0 low water high light	Mt-0 low water low light

Materials and Methods

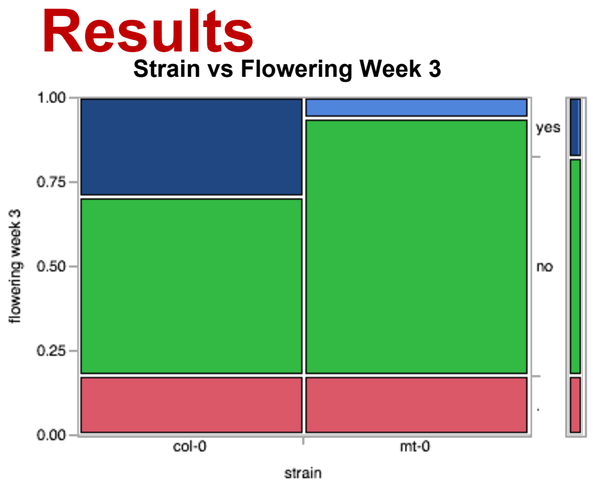
- Col-0 *A. thaliana* (36 plants total)
- Mt-0 *A. thaliana* (36 plants total)
- Soil, and perlite mixture (1:4)
- 40w LED lighting
- 75w LED lighting
- High water- *ad libitum*
- Low water- watered weekly
- The plants were monitored for 5 weeks.
- Plants were watered every Friday. The high water plants had water available 24/7 while low light plants were soaked in water for only 10 minutes once a week. The leaves, plant diameter, and height will be recorded once a week.
- 34 plants successfully germinated, and were then spread out within their experimental group.

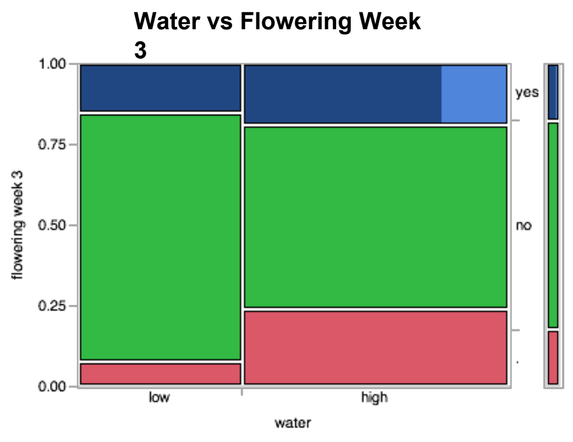


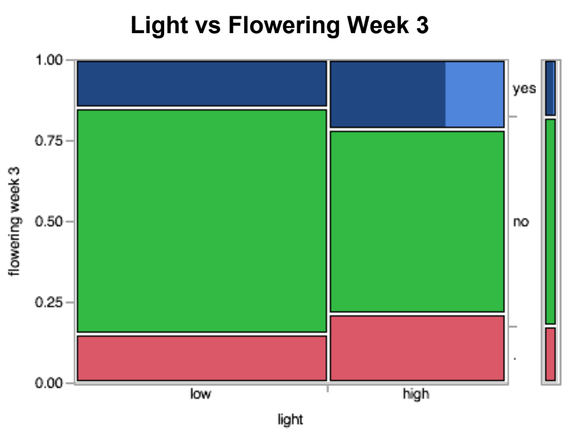
Stratification

High light plants (on the left) and low light plants (on the right). Low water plants in tan tray and high water plants in black tray

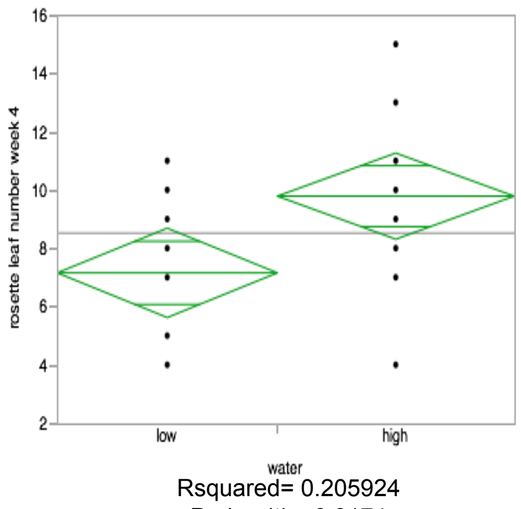
Results





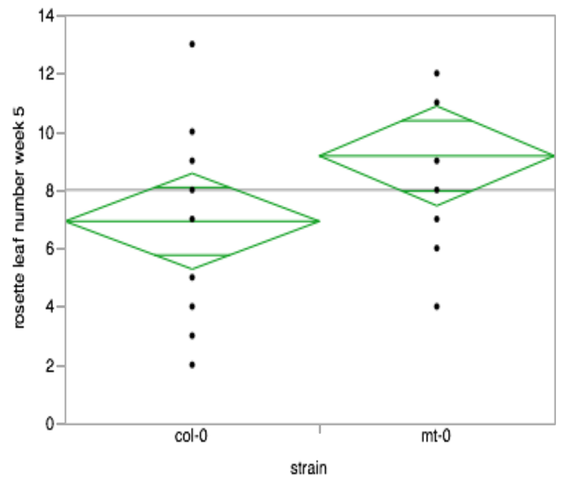


Water Intensity vs Rosette Leaf Number Week 4



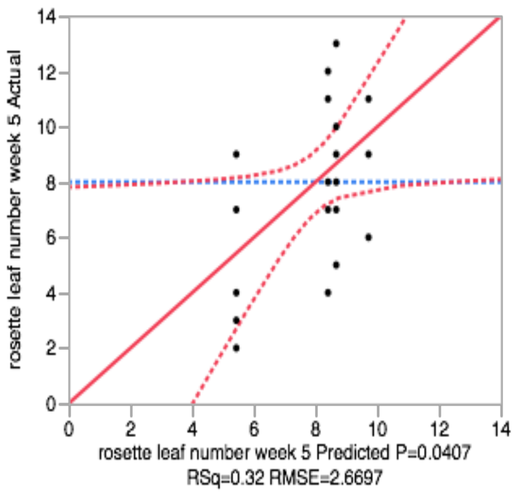
Rsquared= 0.205924
Prob > |t| = 0.0174
Prob > t = 0.0087

Strain vs Rosette Leaf Number Week 5



Rsquared = 0.142774
Prob > t = 0.0313

Response Rosette Leaf Number Week 5 Strain and Light



Discussion

The observations demonstrate the concept that variation in environmental conditions, specifically the intensity of the light and the amount of water available, alters the growth rates and life cycles of plants as they attempt to maximize their fitness. High light and low water were found to place considerable stress upon plants grown in either condition. Several notable differences were observed across treatments including dramatic differences in pigmentation, height, leaf number, and width. Overall, plants grown under high light tended to grow more quickly and had shorter life spans while slower growth and higher leaf number and width was observed under low light. Also, plants grown under low light with high water levels generally survived better than those grown under high light.

Conclusion

The results obtained showed that there was a significant difference in the number of leaves on the rosettes of each trial plant with respect to the amount of water available to them. The variance in light intensity provided no significant differences between the plants. The observations seen during the trials however, showed that the best combination of conditions were low light with high water availability.

Acknowledgements

Thanks to the University of Bridgeport Biology Department for the research opportunity and the University of Bridgeport Engineering Department for printing.

Work Cited

Bailey, Shaun, Robin G. Walters, Stefan Jansson, and Peter Horton. "Acclimation of *Arabidopsis Thaliana* to the Light Environment: The Existence of Separate Low Light and High Light Responses." Planta (2001): 794-801. Print.